

**BAYOU PLAQUEMINE BRULE TMDL FOR AMMONIA**  
**SUBSEGMENT 050201**

US EPA Region 6

Final

May 3, 2001

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	iii
1. Introduction.....	1
2. Study Area Description.....	1
2.1 Bayou Plaquemine Brule Watershed, Subsegment 050201 .....	1
2.2 Water Quality Standards.....	2
2.3 Identification of Sources.....	2
2.3.1 Point Sources.....	3
2.3.2 Nonpoint Sources .....	3
3. Model Documentation .....	3
3.1 Loading Capacity and TMDL Formulation.....	3
3.2 Load Allocations .....	5
3.3 Wasteload Allocations.....	5
3.4 Seasonal Variation.....	6
3.5 Margin of Safety (MOS) .....	6
4. Other Relevant Information .....	6
5. Public Participation.....	7
REFERENCES .....	8

## LIST OF TABLES

Table 1. Land Uses in Segment 0502 .....	2
Table 2. Point Source Wasteload Allocations.....	4
Table 3. Total Maximum Daily Loads.....	5

## EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody. A TMDL has been developed for ammonia for Bayou Plaquemine Brule.

Bayou Plaquemine Brule, subsegment 050201, was listed on the October 28, 1999 Court Ordered §303(d) list as not fully supporting the water quality standard for propagation of fish and wildlife and was ranked as a high priority for TMDL development. Bayou Plaquemine Brule was listed on the October 28, 1999 Court Ordered §303(d) list for ammonia by virtue of its listing in the State of Louisiana's 1993 Nonpoint Source (NPS) Report. This subsegment was listed as "impacted by nonpoint source pollution", with ammonia listed as one of the suspected causes of impact (LDEQ 1993). There is presently no criterion available for ammonia in the State's water quality standards. With no ammonia criterion available to establish a TMDL target, an alternative approach was used. On April 29, 1996, LDEQ issued a declaratory ruling which states: "That DO directly correlates with overall nutrient impact is a well-established biological and ecological principle. Thus, when the LDEQ maintains and protects DO, the LDEQ is in effect also limiting and controlling nutrient concentrations and impacts." DO serves as an indicator for which a water quality criterion exists and is used in the assessment of use support. Therefore, in this TMDL, the ammonia loading required to maintain the dissolved oxygen standard serves as the ammonia TMDL.

This ammonia TMDL includes 16 wasteload allocations, a load allocation, and a margin of safety. As presented in LDEQ (1999), the summer season DO criterion of 3.0 mg/L can be maintained with a 50% reduction of all manmade nonpoint sources and implementation of the wasteload allocations (WLAs) for the point source dischargers. For the winter season, the DO criterion of 5.0 mg/L can be maintained with a 50% reduction from all manmade nonpoint sources and implementation of the WLAs for the point source dischargers.

## **1. Introduction**

Bayou Plaquemine Brule, subsegment 050201 of the Mermentau Basin, was listed on the October 28, 1999 Court Ordered §303(d) list as not fully supporting the water quality standard for the propagation of fish and wildlife and was ranked as a high priority for TMDL development. A TMDL for ammonia was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources of the pollutant of concern, and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions and data inadequacies.

## **2. Study Area Description**

The Mermentau River Basin is located in southwestern Louisiana, and it encompasses the prairie region of the state and a section of the coastal zone. The Mermentau River Basin is approximately 3,710 square miles in area, excluding the gulf waters segment (LDEQ 1987). The streams of the Mermentau Basin are characteristically sluggish due to the gradual slope of the land toward the Gulf. Fish kills have been commonly reported throughout the basin. Additionally, it has been suggested that the water quality problems in the basin may be largely due to agricultural runoff and hydrologic modification (LDEQ 1990a).

### **2.1 Bayou Plaquemine Brule Watershed, Subsegment 050201**

This area is typical of the basin with its low relief, which is an ideal condition for agricultural use as documented in Table 1. Segment 050201 is comprised of Bayou Plaquemine Brule as the main stem with several tributaries. These tributaries include Hazelwood Gully, Coles Gully, Long Point Gully, Bayou Wikoff, Bayou Blanc and North Coulee Trief.

Average annual precipitation in the segment, based on the nearest Louisiana Climatic Station in Crowley is 56.91 inches based on a 30 year record (LSU 1999). Land use in the Mermentau River Basin is largely agricultural, the primary crops being rice and soybeans. Originally, this area was covered by tall prairie grasses, among which there were scattered clumps of trees. (USDA 1962). In the segment under study, agricultural uses account for 89% of the total segment area. Land uses in Segment 050201 are shown in Table 1 (LDEQ 1990b).

Table 1. Land Uses in Segment 0502

Land use	Acres	%
Urban	12,259	3.5
Extractive	1,838	0.5
Agricultural	316,160	89.0
Forest Land	13,475	3.8
Water	536	0.2
Wetland	10,450	2.9
Barren Land	484	0.1
TOTAL AREA	355,202	100.0

## 2.2 Water Quality Standards

The designated uses for Bayou Plaquemine Brule include primary and secondary contact recreation, propagation of fish and wildlife, and agriculture. Bayou Plaquemine Brule was listed on the October 28, 1999 Court Ordered §303(d) list for ammonia by virtue of its listing in the State of Louisiana's 1993 Nonpoint Source (NPS) Report. This subsegment was listed as "impacted by nonpoint source pollution", with ammonia listed as one of the suspected causes of impact (LDEQ 1993). There is presently no criterion available for ammonia in the State's water quality standards (LDEQ 2000).

With no ammonia criterion available to establish a TMDL target, an alternative approach was used. On April 29, 1996, LDEQ issued a declaratory ruling which states: "That DO directly correlates with overall nutrient impact is a well-established biological and ecological principle. Thus, when the LDEQ maintains and protects DO, the LDEQ is in effect also limiting and controlling nutrient concentrations and impacts." DO serves as an indicator for which a water quality criterion exists and is used in the assessment of use support. Therefore, in this TMDL, the ammonia loading required to maintain the dissolved oxygen standard serves as the ammonia TMDL.

## 2.3 Identification of Sources

The sources identified in the *1998 Louisiana Water Quality Inventory* as affecting the water quality of Bayou Plaquemine Brule are irrigated and non-irrigated crop production and urban runoff/storm sewers (LDEQ 1998). Agriculture in the watershed includes row crops, such as sugar cane, corn, sweet potatoes, and soybeans, and some ranching. The 1993 Nonpoint Source Pollution Assessment Report also specifically lists aquaculture, urban and municipal sources, combined sewers, land disposal, and petroleum activities as additional suspected sources of pollution (LDEQ 1993). Other sources of contamination are wild and domesticated animals.

### **2.3.1 Point Sources**

The Bayou Plaquemine watershed includes 66 known dischargers, according to LDEQ's permit tracking system (LDEQ 1999). Many of these dischargers are small and need not be included in a model of this scale. These dischargers are accounted for as nonpoint loading through the process of calibration. Sixteen facilities discharging sanitary wastewater into Bayou Plaquemine Brule and its tributaries were specifically included in this model (see Table 2) (LDEQ, 1999). The source of the dischargers designated with an asterisk (\*) was EPA's NPDES Imaging System. The combined flow of all these discharges is 5,227,600 gallons per day.

### **2.3.2 Nonpoint Sources**

The predominant land uses in Bayou Plaquemine Brule River watershed are agriculture and urban, both of which can contribute to ammonia loads through runoff. It is presently unknown to what relative extent these activities contribute to ammonia loads. Besides rice farming and row crops, there are numerous acres of pasture/grazing land in the watershed where cattle and horses are raised. There are also numerous rural residences where other domesticated animals may be found.

## **3. Model Documentation**

LDEQ submitted a DO model for Bayou Plaquemine Brule subsegment 050201 in March 1999 (LDEQ 1999). The model was reviewed and approved by EPA. This model was used to address the ammonia listing for this subsegment. Tables 5 and 6 in the DO TMDL modeling report included WLAs, LAs, and an MOS for eight point source dischargers (LDEQ 1999). Discharger WLAs were recalculated based on CBOD<sub>5</sub> and NH<sub>3</sub>-N concentrations as listed in LDEQ's 1999 summer and winter TMDL calculations for Bayou Plaquemine Brule (LDEQ 1999). For the additional eight dischargers, the CBOD<sub>5</sub> and NH<sub>3</sub>-N concentrations were selected based on the existing treatment processes currently being utilized. However, if a facility's existing permit contains more stringent limits for CBOD<sub>5</sub> and NH<sub>3</sub>-N, those stringent limits should be used. Tables 2 and 3 present the WLAs, LAs, and MOS for this ammonia TMDL.

### **3.1 Loading Capacity and TMDL Formulation**

According to LDEQ (1999), input data for the calibration model was developed from an intensive survey of Bayou Plaquemine Brule at Church Point conducted October 2-5, 1989, an intensive survey of Bayou Plaquemine Brule at Crowley conducted August 29 – September 2, 1993, an intensive survey of Bayou Blanc at Rayne conducted July 18-23, 1993, the LDEQ ambient monitoring station on Bayou Plaquemine Brule at Esterwood (#58010004), and measurements of Bayou Plaquemine Brule taken at water quality station 0605 near Egan in 1998. Data from an intensive survey of Bayou Plaquemine Brule at Crowley conducted September 18-21, 1989 was not used. A satisfactory calibration was achieved for the main stem and on the tributaries modeled. For the projection models, data was taken from the current municipal discharge permits, current applications, and ambient temperature records.

Table 2. Point Source Wasteload Allocations

Facility	Permit #	Receiving Water	Discharge Flow gallons/day	Summer CBOD5 / NH3-N mg/l	Winter CBOD5 / NH3-N mg/l	Summer CBOD5 WLA lbs/day	Summer NH3-N WLA lbs/day	Winter CBOD5 WLA lbs/day	Winter NH3-N WLA lbs/day
Union Pacific Products*	LA0005444	Bayou Wikoff to Bayou Plaquemine Brule	96,000	20/10	20/10	16.00	8.00	16.00	8.00
Canal Refining - Church Point*	LA0006963	Bayou Plaquemine Brule	50,000	20/10	20/10	8.34	4.17	8.34	4.17
City of Church Point POTW	LA00038598	Bayou Plaquemine Brule	800,000	10/2	20/10	66.72	13.34	133.44	66.72
Baker Performance Chemicals*	LA0064661	Bayou Plaquemine Brule	100	30/15	30/15	0.025	0.0125	0.025	0.0125
City of Crowley Water Plant*	LA0069833	Bayou Blanc to Bayou Plaquemine Brule	68,000	20/10	20/10	11.34	5.67	11.34	5.67
Wright Enrichment Inc. – Crowley*	LA0072184	Bayou Plaquemine Brule	1,000	30/15	30/15	0.25	0.125	0.25	0.125
Plastics, Inc. of Rayne*	LA0084841	Bayou Wikoff to Bayou Plaquemine Brule	1,500	30/15	30/15	0.375	0.188	0.375	0.188
Acadian Fine Foods ltd.	LA0085723	Bayou Wikoff to Bayou Plaquemine Brule	25,000	20/10	30/15	4.15	2.09	6.26	3.13
City of Crowley POTW	LA0041254	Bayou Plaquemine Brule	2,500,000	5/5	10/5	104.25	104.25	208.50	104.25
Opelousas Electric Power Plant*	LA0036145	Bayou Plaquemine Brule	3,000	30/15	30/15	0.750	0.375	0.750	0.375
Village of Estherwood POTW	LA0064530	Coulee Trief to Bayou Plaquemine Brule	80,000	10/10	30/15	6.672	6.672	20.02	10.00
DePree transport Inc. - Church Point*	LA0089036	Bayou Wikoff to Bayou Plaquemine Brule	3,000	30/15	30/15	0.750	0.375	0.750	0.375
Acadiana Treatment - Atwood Acres	LA0074896	Bayou Plaquemine Brule	46,000	10/5	30/15	3.84	1.92	11.50	5.75
North Rayne POTW		Bayou Wikoff to Bayou Plaquemine Brule	20,000	20/10	30/15	3.34	1.76	5.00	2.50
Crowley High School POTW		Bayou Plaquemine Brule	34,000	10/5	30/15	2.84	1.42	8.50	4.25
City of Rayne POTW	LA0039055	Bayou Plaquemine Brule	1,500,000	10/5	10/5	125.10	62.55	125.10	62.55
		TOTAL	5,227,600			354.74	212.92	556.15	278.06
		TOTAL (NH3-N * 4.3=UNBOD)					915.56		1195.66
		TOTAL (CBOD5 * 2.3=UCBOD)				815.90		1279.15	

Note: NH<sub>3</sub>-N represents total nitrogen.

Note: For 5 dischargers (LA0064661, LA0072184, LA0084841, LA0036145, LA0089036) the concentrations for CBOD5 and NH<sub>3</sub>-N were assumed to be 30 mg/l & 15 mg/l, respectively

Note: For 3 dischargers (LA0005444, LA0006963, LA0069833) the concentrations for CBO5 and NH<sub>3</sub>-N were assumed to be 20 mg/l & 10 mg/l, respectively

The model used for this TMDL was QUAL-TX, a steady-state one-dimensional water quality model developed by the Water Quality Standards and Evaluation Section of the Texas Water Commission (now known as the Texas Natural Resource Conservation Commission). It is a modified version of QUAL-II. It incorporates modifications that Texas felt necessary for modeling Texas streams, including the Texas reaeration equation, a variable element size, and coding that allows multiple models to be linked so that they can be executed in a single run. See LDEQ (1999) for a more detailed description.

### 3.2 Load Allocations

Seasonal load allocations are presented in Table 3 of this report. See LDEQ (1999) for a detailed discussion of load allocation. The load allocation in Table 3 is calculated using the nonpoint load allocation presented in Table 5 of LDEQ (1999) minus the wasteload allocation for eight minor discharges listed in Table 2 (LA0064661, LA0072184, LA0084841, LA0036145, LA0089036, LA0005444, LA0006963, and LA0069833).

As presented in LDEQ (1999), the summer season DO criterion of 3.0 mg/L and the winter season DO criterion of 5.0 mg/L can be maintained with a 50% reduction of all manmade nonpoint sources.

Table 3. Total Maximum Daily Loads

ALLOCATION	SUMMER (June – August) lbs/day UBOD=UCBOD+UNBOD	WINTER (September – May) lbs/day UBOD=UCBOD+UNBOD
Point Source WLA	1731.80	2474.81
Margin of Safety*	432.95	618.7
Load Allocation	19,134.65	18,532.65
TMDL	21,299.40	21,626.16

\*MOS for point source loads only

### 3.3 Wasteload Allocations

Seasonal wasteload allocations for individual point source dischargers are presented in Table 2. The total cumulative WLAs for summer and winter are presented in Table 3.

The wasteload allocations for five dischargers (LA0064661, LA0072184, LA0084841, LA0036145, LA0089036) were calculated based on the assumed concentrations for CBOD<sub>5</sub> and NH<sub>3</sub>-N of 30 mg/l and 15 mg/l, respectively. The wasteload allocations for three dischargers (LA0005444, LA0006963, LA0069833) were calculated based on the assumed concentrations for CBOD<sub>5</sub> and NH<sub>3</sub>-N of 20 mg/l and 10 mg/l, respectively. However, if a facility's existing permit contains more stringent limits for CBOD<sub>5</sub> and NH<sub>3</sub>-N, those stringent limits should be used.



### 3.4 Seasonal Variation

Critical conditions for dissolved oxygen in Louisiana have been determined to exist when there is negligible nonpoint run-off and low stream flow combined with high stream temperature. In addition, the models account for loadings that occur at higher flows by modeling sediment oxygen demand. Oxygen demanding pollutants that enter the stream during higher flows settle to the bottom and then exert the greatest oxygen demand during the high temperature seasons. Additionally, the 1999 TMDL looked at the winter and summer seasons by varying temperature.

### 3.5 Margin of Safety (MOS)

The margin of safety (MOS) accounts for any lack of knowledge or uncertainty concerning the relationship between load allocations and water quality. According to LDEQ (1999), the highest temperatures occur in July-August, the lowest stream flows occur in October-November, and the maximum point source discharge occurs following a significant rainfall, i.e. high-flow conditions. The combination of these conditions, in addition to other conservative assumptions regarding rates and loadings, yields an implied MOS estimated to be in excess of 10%. In addition to the implied MOS, LDEQ used an explicit MOS of 20% for the point source loads in its report (LDEQ, 1999). The same margin of safety (20%) was used in this TMDL for point source loads. The total MOS is estimated to exceed 30% for the Bayou Plaquemine Brule TMDL.

## 4. Other Relevant Information

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the State's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program are used to develop the State's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been established by the time the first priority basins are monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring

results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Mermentau River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins  
1999 - Calcasieu and Ouachita River Basins  
2000 – Barataria and Terrebonne Basins  
2001 – Lake Pontchartrain Basin and Pearl River Basin  
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

## **5. Public Participation**

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

## REFERENCES

- LDEQ. 1987. *State of Louisiana Water Quality Management Plan, Volume 4: Boundaries and Inventories*. Office of Water Resources, Baton Rouge.
- \_\_\_\_\_. 1990a. *State of Louisiana Water Quality Management Plan, Volume 5: Water Quality Inventory*. Office of Water Resources, Baton Rouge.
- \_\_\_\_\_. 1990b. *State of Louisiana Water Quality Management Plan, Volume 6, Part A: Nonpoint Source Pollution Assessment Report*. Office of Water Resources, Baton Rouge.
- \_\_\_\_\_. 1993. *State of Louisiana Water Quality Management Plan, Volume 6, Part A: Nonpoint Source Pollution Assessment Report*. Office of Water Resources, Baton Rouge.
- \_\_\_\_\_. 1998. *State of Louisiana Water Quality Management Plan, Volume 5, Part B: Water Quality Inventory*. Office of Water Resources, Baton Rouge.
- \_\_\_\_\_. 1999. *Bayou Plaquemine Brule watershed TMDL for Dissolved Oxygen including Eight Point source Wasteload Allocations and a Watershed Nonpoint Source Loan Allocation, Subsegment 0502. Volume I*. Office of Water Resources, Baton Rouge.
- \_\_\_\_\_. 2000. *Environmental Regulatory Code, Part IX. Water Quality Regulations*. Baton Rouge, LA.
- Louisiana State University. 1999. State Office of Climatology.
- USDA. 1962. Soil Survey Acadia Parish Louisiana, SCS, Series 1959, No.15.